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Glossary of Terms Relating to Brick Kilns

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Clay and Stabilized Soil Products for Construction Sectional Committee, CED 30

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Clay and Stabilized Soil Products for Construction Sectional Committee had been approved by the Civil Engineering Division Council.

There have been considerable developments in the field of brick kiln technology and related practices in last couple of decades in India resulting in usage of various associated terms related to brick kilns. Consequently, it became necessary to formulate a standard to standardize the terminology on a more exact basis so as to avoid ambiguity and confusion. It is hoped that the glossary of terms in this standard would help in fixing a more precise meaning of words which have acquired too general usage. To facilitate ease of reference, the terms have been arranged alphabetically.

These definitions correspond to interpretations as applied to brick kilns only and do not necessarily correspond to the definitions used in other fields. This standard is intended mainly to cover technical definitions of terms relating to brick kilns, and it does not necessarily include all the legal meanings of the terms.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

Indian Standard

GLOSSARY OF TERMS RELATING TO BRICK KILN

1 SCOPE

This standard covers definition of common terms relating to the brick kilns in India.

2 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

2.1 Ash — The non-combustible matter present in the fuel.

2.2 Brick Setting — Arrangement of stacking of the bricks inside the kiln.

2.3 Bull's Trench Brick Kiln — A continuous, moving fire, annular kiln joined on the ends by two semi-circles in which the fire is always burning and moving forward in the direction of air flow due to the draught provided by a chimney and the bricks are being pre-heated, fired and cooled simultaneously in different parts of the kiln. Fire moves in a closed circuit through the bricks stacked in the annular space between the outer and the inner wall of the kiln. Figure 1 shows a typical arrangement of operations and firing zones in a Bull's Trench Brick Kiln.

2.4 Central Island (*Miyana*) — The structure at the centre of the kiln that houses the main and side flues.

2.5 Chamber — A batch of bricks in-between baffle in the trench.

2.6 Charging Condition — The instant during which fuel is fed into the feedholes.

2.7 Chimney — Vertical stack structure that provides ventilation for hot flue gases from the kiln to the outside atmosphere and is also responsible for creating the required draught for operation of kiln.

2.8 Clamp Kiln — Traditional kilns in which firing of bricks is done by stacking the green bricks with fuel under or among them and then setting the fuel on fire.

2.9 Combustion Zone (Firing Zone) — The fuel-feeding zone in which fuel fed from the feedholes provided on the top of the kiln comes in contact with hot air, and combusts.

2.10 Continuous Kiln — Kiln in which all the processes of loading, unloading, cooling, heating, pre-heating take place simultaneously.

2.11 Cooling Zone — The zone in which air entering from the unloading end picks up heat from fired bricks resulting in heating of air and cooling of fired bricks.

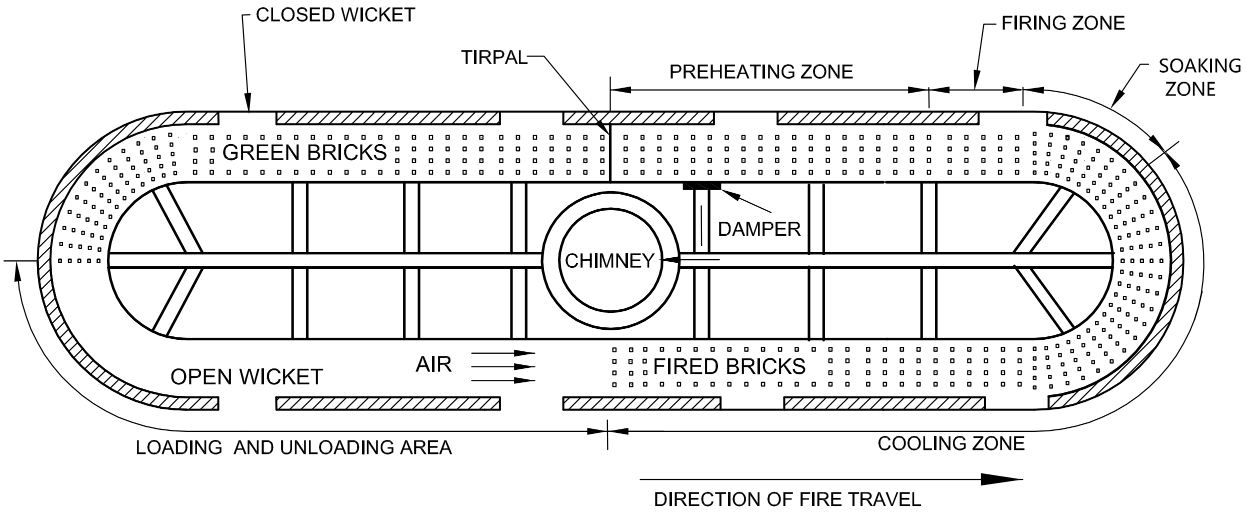

FIG. 1 TYPICAL ARRANGEMENT OF OPERATIONS AND FIRING ZONES IN A BULL'S TRENCH BRICK KILN

2.12 Damper (*Tirpal*) — Temporary partitions, usually made of jute, plastic, iron or corrugate sheets, used for sealing the loading end so as to prevent any inflow/ infiltration of air from the loading side.

2.13 Down Draught Kiln — An intermittent type of kiln, consisting of a firing chamber/kiln connected with a chimney through an underground flue, in which hot gases from the burning fuel are first deflected to the roof of the kiln and then are drawn downwards by the natural draught through the green bricks to fire them.

2.14 Draught — The suction force caused due to the difference in weight between the lighter hot gases accumulating inside the chimney and the ambient air outside, required to supply air into the kiln for optimum combustion and to remove the flue gases.

2.15 Fan — A fan, used to create induced draught, placed at the exit end of the flow path pulling hot air from the flue to the chimney.

2.16 Feedhole Cover — Plates that cover the feedholes through which fuel is fed.

2.17 Feeding Spoon — Spoons that are used to feed fuel through feedholes into firing zone.

2.18 Fixed Chimney — Fixed permanent stack located at the centre of the kiln that provides the natural draught.

2.19 Flue Damper (***Chabbi***) **—** Plate dampers that are used to control the openings in side flues to control the draught, thereby ensuring least fall in flue gas temperature, and obtain upcast of flame in the combustion zone.

2.20 Flue Gases — The gases that are released as a result of burning of fuel.

2.21 Fuel — Solid materials, such as coal, firewood and agricultural residues, which can be burnt to release energy.

2.22 Fuel Feeding Rate — Rate at which fuel is fed through feedholes.

2.23 Fugitive Dust — Emissions released from non-chimney sources such as ash and brick dust.

2.24 ***Gali*** — The narrow space between outer and inner wall on the either edge of the zig-zag kiln.

2.25 Gravitational Settling Chamber — A particulate collection structure consisting of baffles and fins in a manner that obstructs the flue gases and lengthen their residence time, thereby reducing the velocity of the flow resulting in deposition of particulate matter under the action of gravity before they enter the chimney, without causing any significant pressure drop.

2.26 Green Bricks — Moist moulded clay bricks ready for loading and firing in the kiln are called green bricks.

2.27 Heat Loss — Transfer of heat through the walls of the kiln, wicket gates and kiln floor from inside to outside, either through conduction, convection or any combination of these, as the temperature inside the kiln is higher than ambient temperature.

2.28 Hoffman Kiln — Annular continuous kiln with massive walls and a large chimney at the centre to which underground radial flues converge from the inside walls of each of the arch shaped chambers, each of which has several small feed holes in the roof arches through which fuel is fed into spaces made among the bricks to be fired. Openings for loading and unloading the individual firing chambers exist at outer wall of the kiln. The firing zone is moved forward and the corresponding changes are made to the dampers between the chambers and into the chimney. The chambers being loaded and unloaded move forward in sequence, and this way heat is extracted from the cooling bricks and also from the hot combustion gases. As the fire passes round the kiln, the chambers in front of the actual firing zone are gradually pre-heated, and the chambers behind cool off slowly.

2.29 Hybrid Hoffman Kiln — Hoffman kiln with parallel tunnels built side by side connected by curved tunnels at either end having chimney outside the kiln structure.

2.30 Induced Draught (Forced Draught) — Draught provided by the fan installed at the exit end of the flow path pulling hot air from the flue to the chimney.

2.31 Intermittent Kiln — Periodic type of kiln in which bricks are fired in batches as only one process out of loading, unloading, firing and cooling can take place at one time.

2.32 Kiln — A large furnace/oven used for the firing of bricks. The brick firing process consists essentially of increasing the temperature of the bricks progressively over a period of time, holding it at a peak temperature (at about 800 - 1 100°C), and then cooling back to the ambient temperature. Kilns are, mainly, of two types - Intermittent and Continuous kilns.

2.33 Lightning Arrester — A protective device installed at the top of the chimney that reduces excessive voltage resulting from lightning to a safe level by grounding the discharge.

2.34 Main Flue (Main ***Nali)*** **—** The main ducts through which flue gases flows towards the chimney.

2.35 Moving Chimney — Metal chimneys placed on the top of the brick setting that were moved around the kiln as the firing progresses.

2.36 Natural Draught — Draught provided by the chimney located at the centre of the kiln.

2.37 Non-charging Condition — The time period between the two successive charging conditions.

2.38 Particulate Matter — Small solid particles of material found in the atmosphere in addition to gases.

2.39 Pocket — The bricks joining two adjacent lines in brick setting, on which fuel settles during feeding.

2.40 Pre-heating Zone — The zone in which heat available in the flue gases is utilized for drying and pre-heating of green bricks.

2.41 Scove Kiln — Clamp kiln insulated by packing earth or mud around it.

2.42 Shunt — A metal/fibre flue, which is used to connect the main flue of the chimney with the side flues in the kiln.

2.43 Shuttle Kiln — An intermittent type of kiln consisting of a car which moves back and forth from the loading/ unloading position to the firing chamber. Burners are positioned at top and bottom on each side of the car, creating a turbulent circular air flow.

2.44 Side Flue (Side *Nali*) — The ducts or inlets, constructed at regular spacing at right angles to the main flue, that connect trench and the main flue.

2.45 Trench — Space between outer and inner wall of the kiln where bricks are stacked for firing.

2.46 Tunnel Brick Kiln — A horizontal moving ware continuous kiln in which bricks to be fired are passed on cars through a long horizontal tunnel and the firing zone remains stationary near the centre of the tunnel, while the bricks and air move in counter-current paths. Cold air is drawn from the car exit end of the kiln cooling the fired bricks while the combustion gases travel towards the car entrance transferring part of their heat to the incoming green bricks. Figure 2 shows a typical arrangement of operations and firing zones in a Tunnel Brick Kiln.

2.47 Vertical Portion of Side Flue — A vertical rectangular structure that serves as connector between side and main flue with a shunt.

2.48 Vertical Shaft Brick Kiln — A moving ware continuous kiln in which green bricks loaded on the top platform move slowly down to the central firing zone in a vertical downward direction and the upward air movement is brought about by natural convection from the fresh air coming from below which cools the fired bricks before unloading. The kiln works as a counter-current heat exchanger, with heat transfer taking place between the upward moving air and downward moving bricks. Figure 3 shows a typical arrangement of operations and firing zones in a vertical shaft brick kiln.

2.49 Water Gauge — Pressure required to support a water column of the specified height.

2.50 Wicket Gate — The openings made in the outer wall for easy access to the trench for setting and withdrawal of bricks.

2.51 Zig-Zag Brick Kiln — A rectangular, continuous, moving fire kiln in which length of the fire travel path is increased by arranging the bricks in chamber-wise brick setting that allows the fire to follow a zig-zag path instead of a straight path followed in Bull's Trench Brick Kiln. This results in increased air velocities and more turbulence in kiln resulting in better mixing of fuel and air and improved heat transfer between fire and bricks. Figure 4 shows a typical arrangement of operations and firing zones in a zig-zag brick kiln.

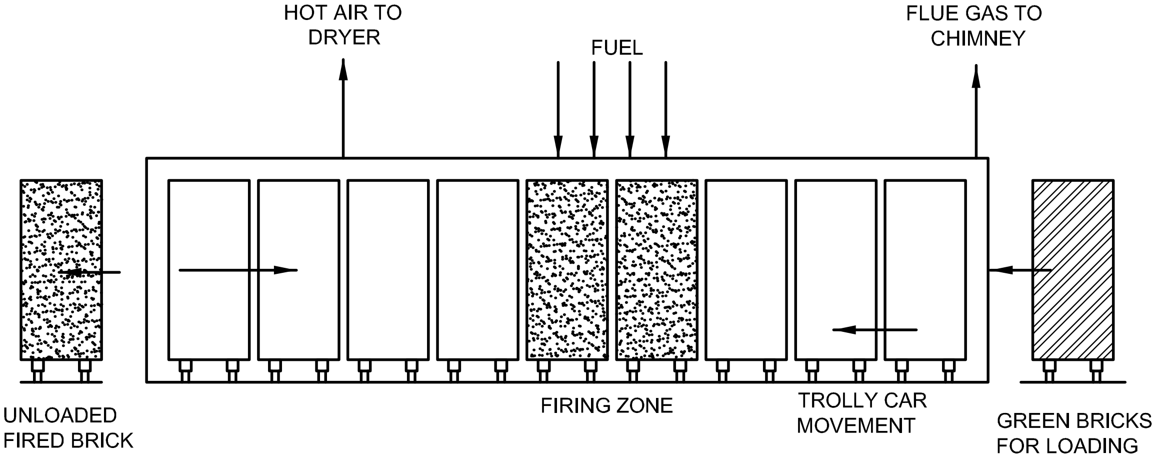

Fig. 2 Typical Arrangement of Operations and Firing Zones In a Tunnel Brick Kiln

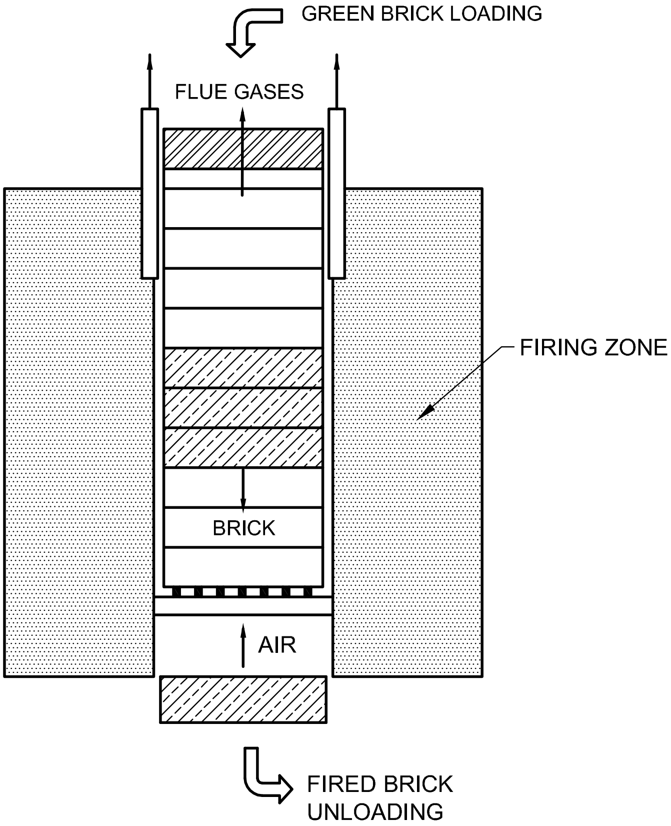

Fig. 3 Typical Arrangement of Operations and Firing Zones in a Vertical Shaft Brick Kiln

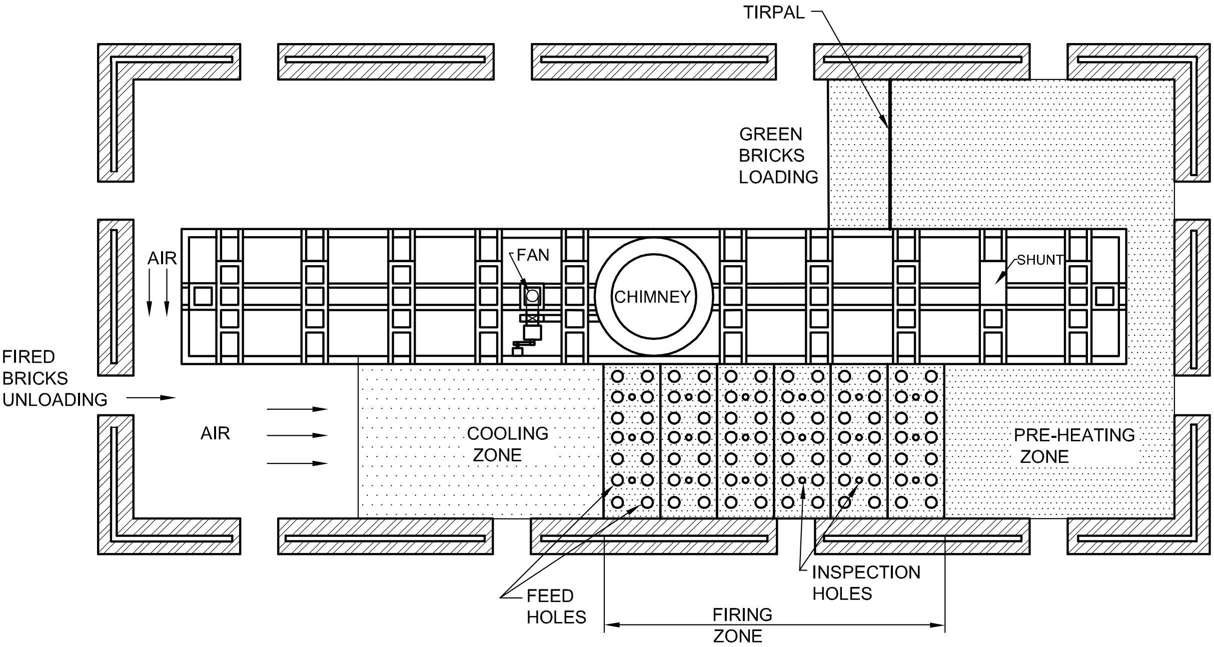

Fig. 4 Typical Arrangement of Operations and Firing Zones in a Zig-Zag Brick Kiln

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Clay and Stabilized Soil Products for Construction Sectional Committee, CED 30

Organization	*Representative(s)*
CSIR-Central Building Research Institute, Roorkee	Shri A. K. Minocha (***Chairman***)
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Auroville Earth Institute, Auroville	Representative
Building Materials &Technology Promotion Council, New Delhi	Shri Sharad Gupta Shri Pankaj Gupta (*Alternate*)
Central Pollution Control Board, New Delhi	Shri B. Vinod Babu
Central Power Research Institute, Bengaluru	Representative
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CSIR-Central Building Research Institute, Roorkee	Shri A. K. Minocha Shri L. P. Singh (*Alternate*)
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The Energy and Resources Institute, New Delhi	Shri Sachin Kumar

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